CS 179

Design of Useful and Usable Interactive Systems

Harvard John A. Paulson
School of Engineering
and Applied Sciences

Questions of Shopping Week

Is this class a good fit for me?

Questions of Shopping Week

1. What will I get out of the Design of Useful and Usable Interactive Systems if I enroll?
2. What is the syllabus & timeline?
3. What is a given class period like?
4. Link to submit the application

Harvard John A. Paulson
School of Engineering
and Applied Sciences

Questions of Shopping Week

1. **What will I get out of the Design of Useful and Usable Interactive Systems if I enroll?**
2. What is the syllabus & timeline?
3. What is a given class period like?
4. Link to submit the application

- ★ Design Arguments Framework, i.e., iteratively refining well-matched
  - ★ **Need theses**
  - ★ **Approach theses**
- ★ Practice identifying the **riskiest risks** and designing minimal information gathering techniques to **lower uncertainty**

Questions of Shopping Week

1. **What will I get out of the Design of Useful and Usable Interactive Systems if I enroll?**
2. What is the syllabus & timeline?
3. What is a given class period like?
4. Link to submit the application

- ★ Practice iteratively designing useful and usable **screen-based** interactive systems
- ★ No coding allowed, unless current prototyping tools do not afford a critical characteristic of your design and it is within your existing reach as a programmer

Harvard John A. Paulson
School of Engineering
and Applied Sciences

Questions of Shopping Week

1. What will I get out of the Design of Useful and Usable Interactive Systems if I enroll?
2. **What is the syllabus & timeline?**
3. **What is a given class period like?**
4. Link to submit the application

- ★ 1 month group project on provided topic
- ★ 2 month group project on group-chosen topic
- ★ 2 active learning sessions per week
  - ★ 5-10 min design critique
  - ★ 30 min traditional lecture
  - ★ 30 min group project-based think-pair-share
  - ★ 5 min session feedback
- ★ 1 TF-led project feedback studio per week

Questions of Shopping Week

1. What will I get out of the Design of Useful and Usable Interactive Systems if I enroll?
2. What is the syllabus & timeline?
3. What is a given class period like?
4. **Link to submit the application**

- ★ Link released at the end of class
- ★ Space is limited by Pierce 301
- ★ Lottery entries due by 7 PM on Wednesday
- ★ Results will be announced by Friday morning
- ★ Emailing me will not help

Harvard John A. Paulson
School of Engineering
and Applied Sciences

Expectations: Roles

Professor

- Explain concepts and frameworks that support designing useful and usable systems
- Address escalated issues or issues you do not feel comfortable discussing with your TF

TFs

- First point of contact on course-related matters
- Timely constructive feedback that refers to concepts and frameworks mentioned in class

Students

- Show up (attendance is mandatory)
- Be "vulnerable professionally"
- Give and receive constructive criticism
- Be a good teammate
- Focus on progress

Expectations: Grades

Professor

- Assign final grades based on participation in lectures, studio, and group projects, and how well you engaged with teaching staff's feedback, with some calibration across TFs

TFs

- Assign grades for individual deliverables

Students

- Sincerely engage with prompts
- Show and explain how feedback was acted upon
- Submit deliverables on time

Expectations: Communication

Professor	**TFs**	**Students**
• Respond to course-related messages within 2 weekdays	• Respond to course-related messages within 1 weekday	• As soon as you know, communicate with your team, then your TF if there is an emergency (illness, family obligation) that prevents you from fulfilling your class responsibilities

Harvard John A. Paulson
School of Engineering
and Applied Sciences

Questions of Shopping Week

1. **What will I get out of the Design of Useful and Usable Interactive Systems if I enroll?**
2. What is the syllabus & timeline?
3. What is a given class period like?
4. Link to submit the application

- Design Arguments Framework, i.e., iteratively refining well-matched
  - **Need theses**
  - **Approach theses**
- Practice identifying the **riskiest risks** and designing minimal information gathering techniques to **lower uncertainty**

Harvard John A. Paulson
School of Engineering
and Applied Sciences

Design Arguments

Supporting clarity during the design process

Harvard John A. Paulson
School of Engineering
and Applied Sciences

Design Arguments

Need

Stakeholders + Domain Person **P** [in setting **S**]
Core tension wants to achieve goal **G** but obstacles $\mathbf{O_{1-N}}$ get in the way.

Any solution also has to:
satisfy constraints $\mathbf{X_{1-N}}$,
minimize costs $\mathbf{Y_{1-N}}$,
and avoid obstacles $\mathbf{Z_{1-N}}$.

Axioms As designers, we bring the following
principles and constraints $\mathbf{A_{1-N}}$.

Our approach, ____________,
has characteristics $\mathbf{C_{1-N}}$
that help stakeholders achieve their
goal **G** while avoiding obstacles $\mathbf{O_{1-N}}$.

Design Argument #1

Evidence

How do you know?

Need

Need Thesis

Stakeholders + Domain Person **P** [in setting **S**]
Core tension wants to achieve goal **G** but obstacles $\mathbf{O_{1\text{-}N}}$ get in the way.

Evidence

How do existing approaches fail?

Any solution also has to:
satisfy constraints $\mathbf{X_{1\text{-}N}}$,
minimize costs $\mathbf{Y_{1\text{-}N}}$,
and avoid obstacles $\mathbf{Z_{1\text{-}N}}$.

Axioms As designers, we bring the following principles and constraints $\mathbf{A_{1\text{-}N}}$.

Approach Thesis

Our approach, ______________,
has characteristics $\mathbf{C_{1\text{-}N}}$
that help stakeholders achieve their goal **G** while avoiding obstacles $\mathbf{O_{1\text{-}N}}$

Evidence

What characteristics have you borrowed from solutions that succeeded in analogous settings?

What differentiates your approach from previous solutions that failed?

How have stakeholders responded to/been able to use your approach?

Design Argument #2

Evidence

How do you know?

Need

Need Thesis

Stakeholders + Domain Person **P** [in setting **S**]
Core tension could achieve goal **G** if obstacles $\mathbf{O}_{1\text{-}N}$ were removed.

Any solution also has to:
satisfy constraints $\mathbf{X}_{1\text{-}N}$,
minimize costs $\mathbf{Y}_{1\text{-}N}$,
and avoid obstacles $\mathbf{Z}_{1\text{-}N}$.

Evidence

How do existing approaches fail?

Axioms As designers, we bring the following principles and constraints $\mathbf{A}_{1\text{-}N}$.

Approach Thesis

Our approach, ____________,
has characteristics $\mathbf{C}_{1\text{-}N}$
removes obstacles $\mathbf{O}_{1\text{-}N}$ so that
stakeholders can achieve goal **G**.

Evidence

What characteristics have you borrowed from solutions that succeeded in analogous settings?

What differentiates your approach from previous solutions that failed?

How have stakeholders responded to/been able to use your approach?

Visualizing API Usage Examples at Scale

Elena L. Glassman[‡*], **Tianyi Zhang**[‖*], **Björn Hartmann**[‡], **Miryung Kim**[‖]
[‡*]UC Berkeley, Berkeley, CA, USA
[‖*]UC Los Angeles, Los Angeles, CA, USA
{eglassman, bjoern}@berkeley.edu, {tianyi.zhang, miryung}@cs.ucla.edu

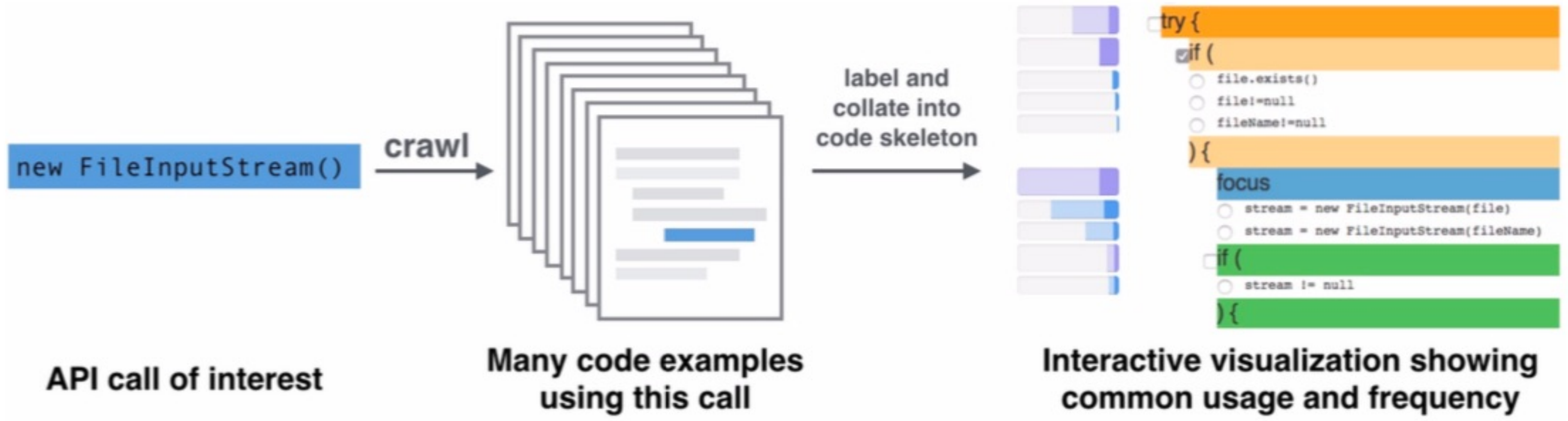

new FileInputStream()
crawl
label and collate into code skeleton
API call of interest
Many code examples using this call
Interactive visualization showing common usage and frequency
try {
if (
file.exists()
file!=null
fileName!=null
) {
focus
stream = new FileInputStream(file)
stream = new FileInputStream(fileName)
if (
stream != null
) {

Figure 1. **EXAMPLORE takes a focal API call that a programmer is interested in, locates uses of that API call in a large corpus of mined code examples, and then produces an interactive visualization that lets programmers explore common usage patterns of that API across the corpus.**

ABSTRACT

Using existing APIs properly is a key challenge in programming, given that libraries and APIs are increasing in number and complexity. Programmers often search for online code examples in Q&A forums and read tutorials and blog posts to learn how to use a given API. However, there are often a massive number of related code examples and it is difficult for a user to understand the commonalities and variances among them, while being able to drill down to concrete details. We introduce an interactive visualization for exploring a large collection of code examples mined from open-source repositories at scale. This visualization summarizes hundreds of code examples in one synthetic code skeleton with statistical distributions for canonicalized statements and structures enclosing an API call. We implemented this interactive visualization for a set of Java APIs and found that, in a lab study, it helped users (1) answer significantly more API usage questions correctly and comprehensively and (2) explore how other programmers have used an unfamiliar API.

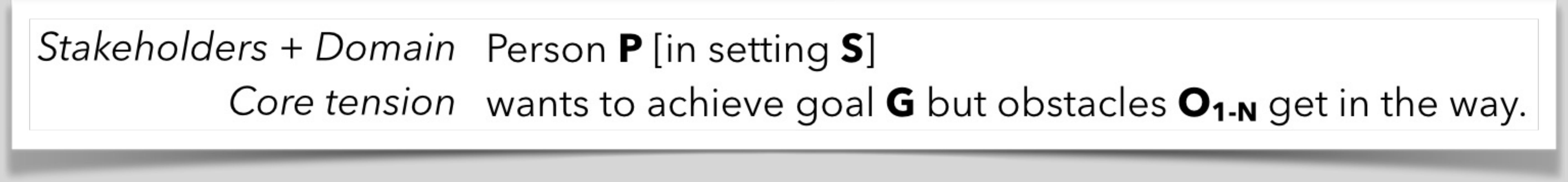
INTRODUCTION

Learning how to correctly and effectively use existing APIs is a common task — and a core challenge — in software development. It spans all expertise levels from novices to professional software engineers, and all project types from prototypes to production code. The landscape of publicly available APIs is massive and constantly changing, as new APIs are created in response to shifting programmer needs. Within companies, the same is true, perhaps even more so: joining a company can require learning a whole new set of proprietary APIs before a developer becomes an effective contributor to the company codebase. Developers often are stymied by various learning barriers, including overly specific or overly general explanations of API usage, lack of understanding about the interaction between multiple APIs, lack of alternative uses, and difficulty identifying program statements and structures related to an API [11, 19, 5].

One study found that the greatest obstacle to learning an API is "*insufficient or inadequate examples.*" [19] Official documenta-

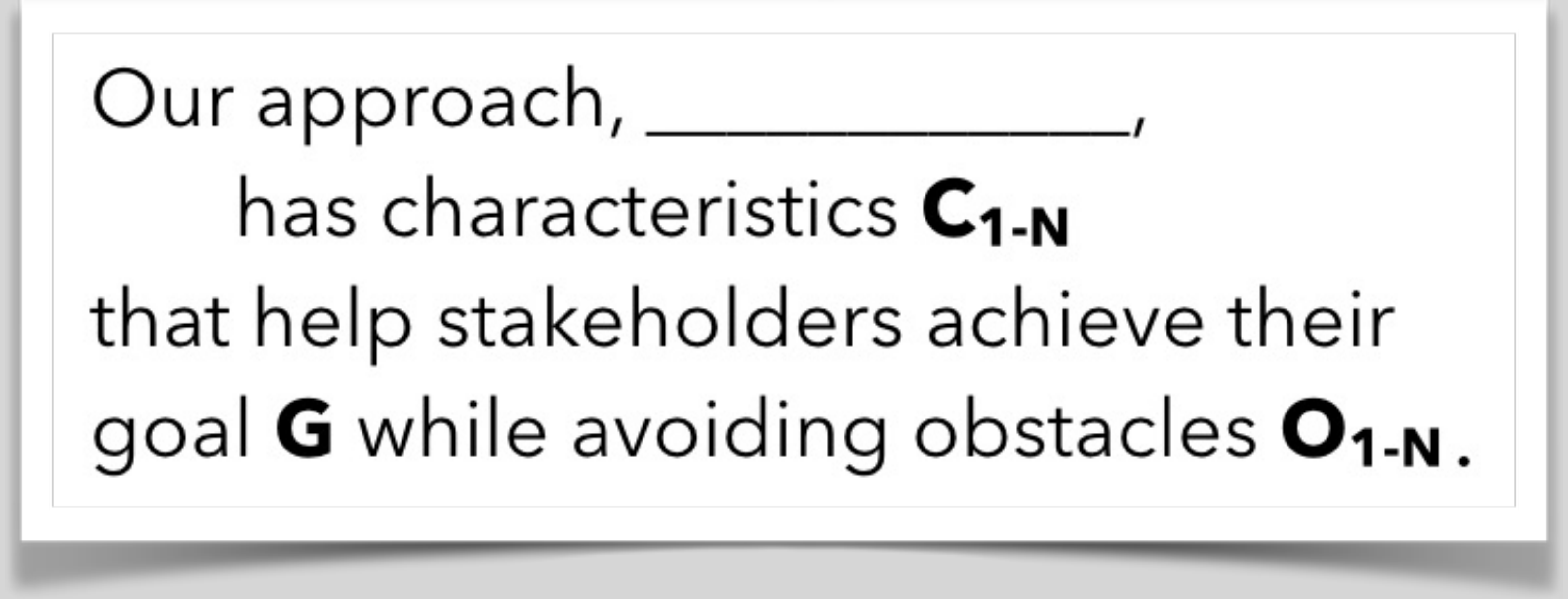
Practicing Making Design Arguments

1. Identify a designed *object* | *environment* | *tool* | *interface*
2. What is the need thesis that might have inspired this designing?



Stakeholders + Domain	Person $\mathbf{P}$ [in setting $\mathbf{S}$]
Core tension	wants to achieve goal $\mathbf{G}$ but obstacles $\mathbf{O}_{1\text{-}N}$ get in the way.

3. What are the characteristics of the design that enable reaching the goal and address the obstacles?



Our approach, ____________,
has characteristics $\mathbf{C}_{1\text{-}N}$
that help stakeholders achieve their
goal $\mathbf{G}$ while avoiding obstacles $\mathbf{O}_{1\text{-}N}$.

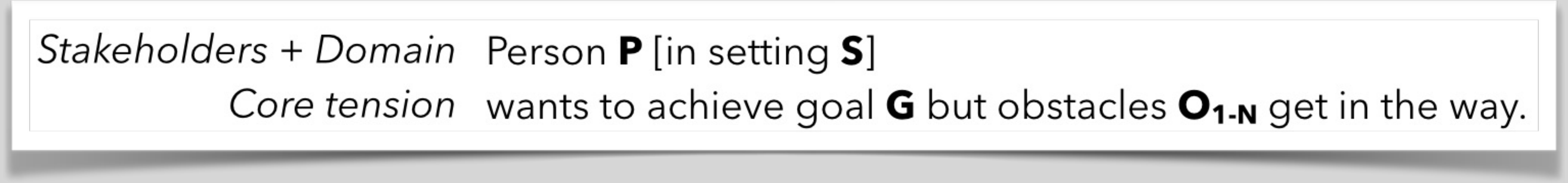
Riskiest Risks

Heading off unpleasant surprises

Harvard John A. Paulson
School of Engineering
and Applied Sciences

Practicing Identifying and Addressing Riskiest Risks

1. Identify an *object* | *environment* | *tool* | *interface* you might want to design
2. What is the need thesis that inspires this design?



Stakeholders + Domain	Person **P** [in setting **S**]
Core tension	wants to achieve goal **G** but obstacles $\mathbf{O}_{1\text{-}N}$ get in the way.

3. What are you assuming is true that, if it were false, would have the biggest impact on the design?
4. What strategy might take the minimal amount of effort to reduce your uncertainty about whether your assumption is true?

Elena L. Glassman

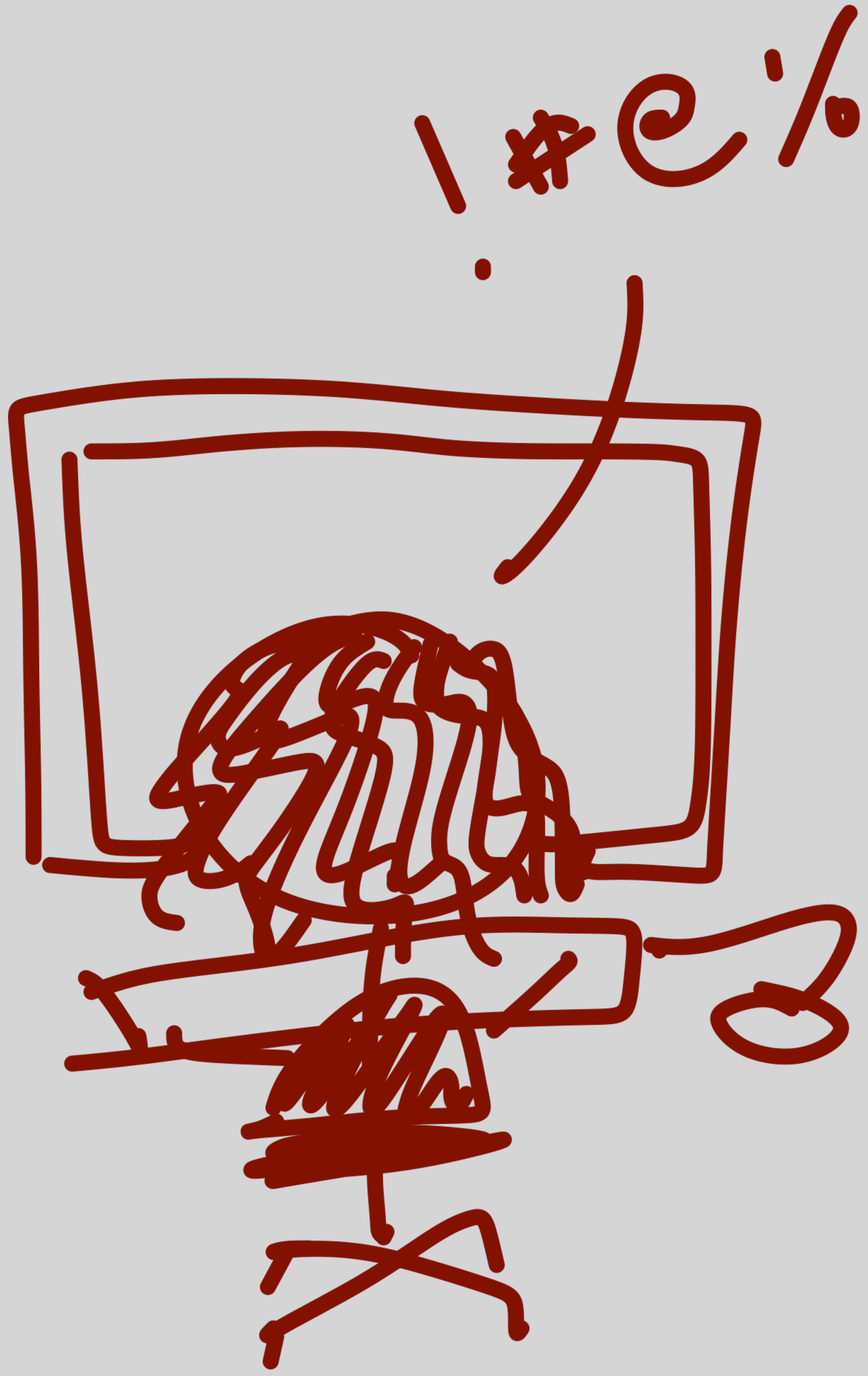
Assistant Professor of Computer Sciences

Specializing in Human-Computer Interaction (HCI)

Harvard John A. Paulson
School of Engineering
and Applied Sciences

I’m an HCI person.

I build novel interfaces and evaluate them in studies.



The topic of the grant I submitted last night

- **CS Theory:** *What systems are buildable?*
- **Psychology/CogSci/Linguistics:** *What systems most accurately model human cognition?*
- **HCI:** *What systems can humans use?*

Team Introductions

Harvard John A. Paulson
School of Engineering
and Applied Sciences

Questions of Shopping Week

1. What will I get out of the Design of Useful and Usable Interactive Systems if I enroll?
2. What is the syllabus & timeline?
3. What is a given class period like?
4. **Link to submit the application**

- ★ Link released at the end of class
- ★ Space is limited by Pierce 301
- ★ Lottery entries due by 7 PM on Wednesday
- ★ Results will be announced by Friday morning
- ★ Emailing me will not help

Harvard John A. Paulson
School of Engineering
and Applied Sciences